

10/537315₂

Preliminary Amendment
Application No. 10/
based on PCT/GB2003/005303

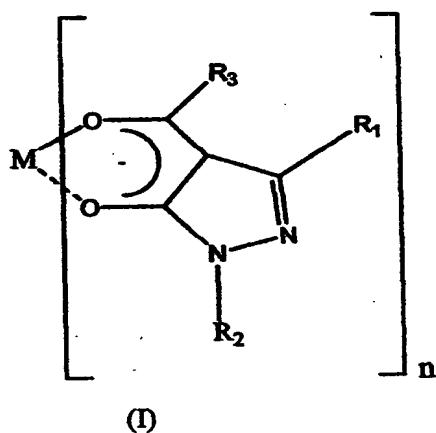
JC20 Rec'd PCT/PTO 02 JUN 2005
PATENT
Attorney Docket No.: LUC-012

Listing of Claims

Please amend the claims as follows. This listing of claims will replace all prior versions and listings of claims in the application:

1 – 23. Canceled.

24. (New) An electroluminescent compound which has the general chemical formula



wherein M is a metal other than aluminum; n is the valency of M; R₁, R₂ and R₃, which may be the same or different, are selected from the group consisting of hydrogen, hydrocarbyl groups, substituted and unsubstituted aliphatic groups, substituted and unsubstituted aromatic, heterocyclic and polycyclic ring structures, fluorocarbon groups, halogen groups, thiophenyl groups, and nitrile groups; or alternatively R₁ and R₃ can form ring structures, or any of R₁, R₂ and R₃ can be copolymerized with a monomer.

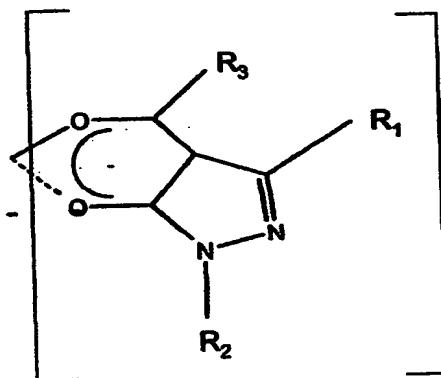
25. (New) A compound according to claim 24 wherein M is selected from the group consisting of gallium, indium, germanium, tin (II), tin (IV), antimony (II), antimony (IV),

lead (II), lead (IV), metals of the first, second and third groups of transition metals in any valence states, manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium, titanium, vanadium, zirconium, tantalum, molybdenum, rhodium, iridium, niobium, scandium and yttrium.

26. (New) An electroluminescent compound which has the general chemical formula



wherein $L\alpha$ has the general chemical formula

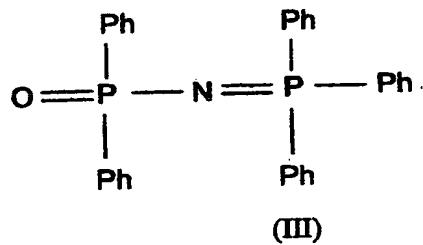


(II)

M is a metal, n is the valency of M, L_p is a neutral ligand, and R_1 , R_2 and R_3 , which may be the same or different, are selected from the group consisting of hydrogen, hydrocarbyl groups, substituted and unsubstituted aliphatic groups, substituted and unsubstituted aromatic, heterocyclic and polycyclic ring structures, fluorocarbon groups, halogen groups, thiophenyl

groups, and nitrile groups; or alternatively R₁ and R₃ can form ring structures, or any of R₁, R₂ and R₃ can be copolymerized with a monomer.

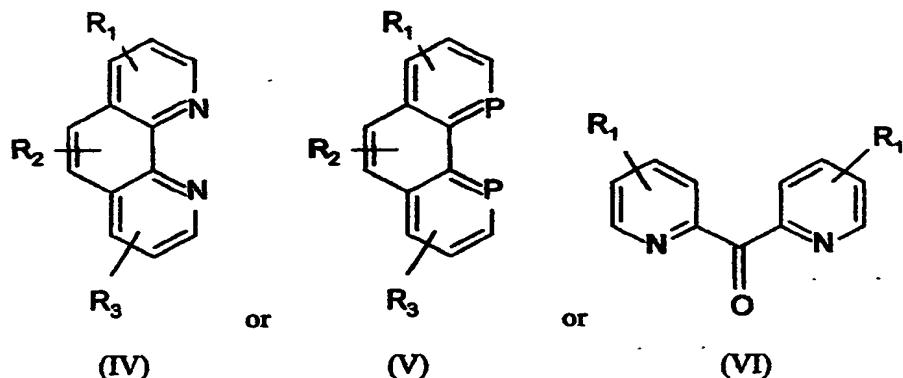
27. (New) An electroluminescent compound according to claim 26 wherein the groups L_P are selected from compounds having the general chemical formula



wherein each Ph which can be the same or different and is selected from the group consisting of phenyl (OPNP) and substituted phenyl groups, other substituted or unsubstituted aromatic groups, substituted or unsubstituted heterocyclic or polycyclic groups, substituted or unsubstituted fused aromatic groups, naphthyl groups, anthracene groups, phenanthrene groups, and pyrene groups, and the substituents in substituted phenyl groups are selected from the group consisting of alkyl groups, aralkyl groups, alkoxy groups, aromatic groups, heterocyclic groups, polycyclic groups, halogen groups, cyano groups, amino groups groups having any of the following general chemical formulas:

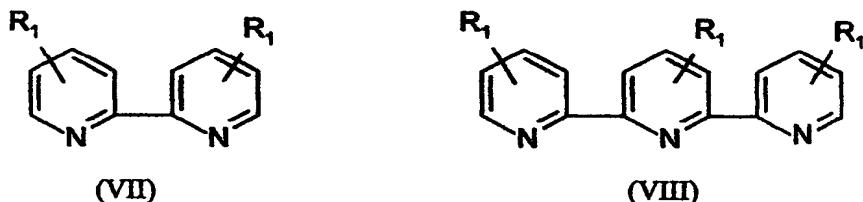
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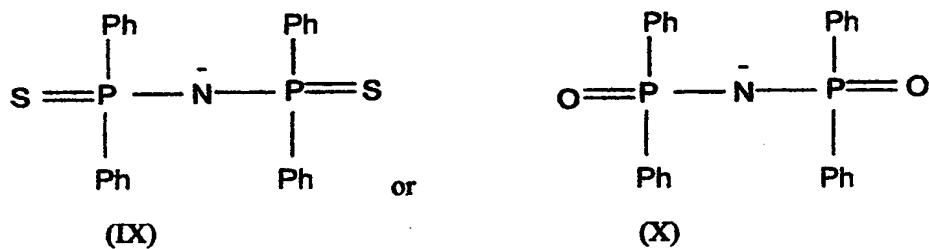


wherein R_1 , R_2 and R_3 are as previously defined;

groups having any of the following general chemical formulas:



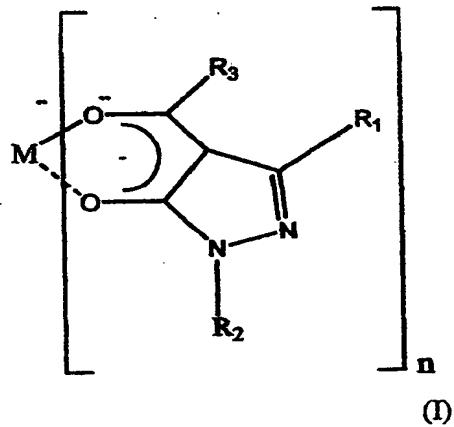
wherein R₁, R₂ and R₃ are as previously defined; and groups having any of the following general chemical formulas:



wherein Ph is as previously defined.

28. (New) An electroluminescent compound according to claim 26 wherein M is a metal selected from the group consisting of gallium, indium, aluminum, germanium, tin (II), tin (IV), antimony (II), antimony (IV), lead (II), lead (IV) and metals of the first, second and third groups of transition metals in different valence states e.g. manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium, titanium, vanadium, zirconium, tantalum, molybdenum, rhodium, iridium, niobium, scandium or yttrium.

29. (New) An electroluminescent device comprising: (i) a first electrode; (ii) an electroluminescent layer consisting essentially of a layer of an electroluminescent complex according to claim 24 of the general chemical formula



wherein M, n, R₁, R₂ and R₃ are as previously defined; and (iii) a second electrode.

30. (New) An electroluminescent device according to claim 29 wherein M is selected from the group consisting of gallium, indium, germanium, tin (II), tin (IV), antimony (II), antimony (IV), lead (II), lead (IV), metals of the first, second and third groups of transition metals in any valence states, manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium, titanium, vanadium, zirconium, tantalum, molybdenum, rhodium, iridium, niobium, scandium, and yttrium; and further wherein R₃ is a phenyl or substituted phenyl group.

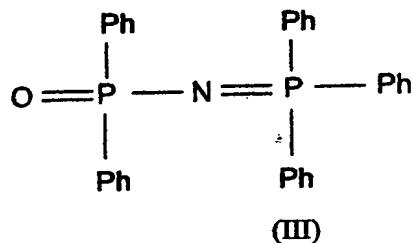
31. (New) An electroluminescent device comprising: (i) a first electrode; (ii) an electroluminescent layer consisting essentially of a layer of an electroluminescent compound according to claim 26 of the general chemical formula



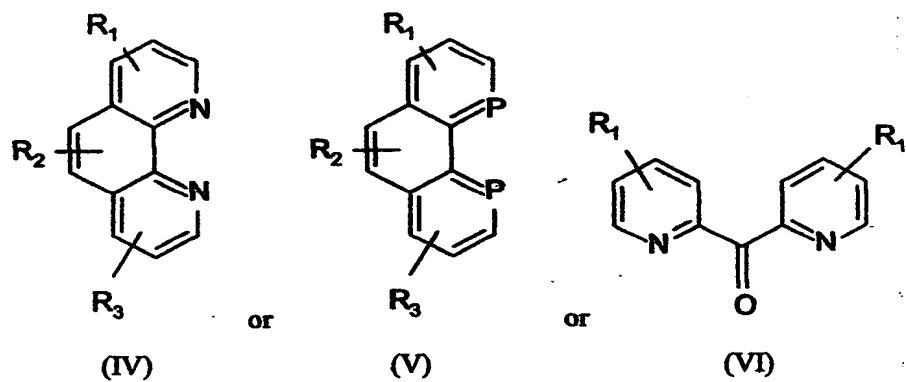
wherein L_{\alpha}, M, n and L_p are as previously defined; and (iii) a second electrode.

32. (New) An electroluminescent device according to claim 31 wherein M is a metal selected from gallium, indium, aluminum, germanium, tin (II), tin (IV), antimony (II), antimony (IV), lead (II), lead (IV) and metals of the first, second and third groups of transition metals in different valence states e.g. manganese, iron, ruthenium, osmium, cobalt, nickel, palladium(II), palladium(IV), platinum(II), platinum(IV), cadmium, chromium, titanium, vanadium, zirconium, tantalum, molybdenum, rhodium, iridium, niobium, scandium or yttrium.

33. (New) An electroluminescent device according to claim 31 wherein the groups L_P are selected from compounds having the general chemical formula

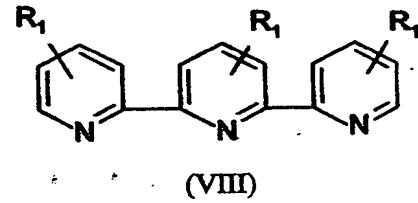
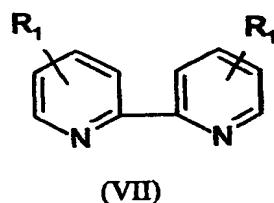


wherein each Ph which can be the same or different and is selected from the group consisting of phenyl (OPNP) and substituted phenyl groups, other substituted or unsubstituted aromatic groups, substituted or unsubstituted heterocyclic or polycyclic groups, substituted or unsubstituted fused aromatic groups, naphthyl groups, anthracene groups, phenanthrene groups, and pyrene groups, and the substituents in substituted phenyl groups are selected from the group consisting of alkyl groups, aralkyl groups, alkoxy groups, aromatic groups, heterocyclic groups, polycyclic groups, halogen groups, cyano groups, amino groups, groups having any of the following general chemical formulas:

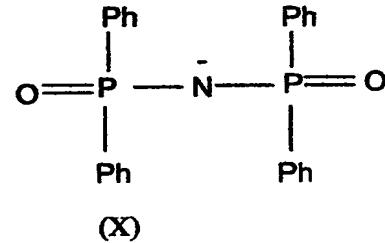
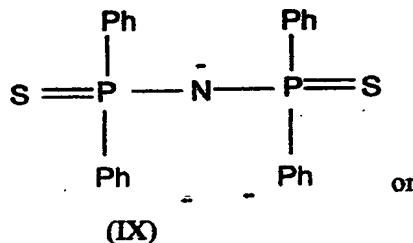


wherein R₁, R₂ and R₃ are as previously defined;

groups having any of the following general chemical formulas:



wherein R₁, R₂ and R₃ are as previously defined; and groups having any of the following general chemical formulas:



wherein Ph is as previously defined.

34. (New) An electroluminescent device according to claim 29 wherein there is a layer of a hole transmitting material between the first electrode and the layer of the electroluminescent complex.

35. (New) An electroluminescent device according to claim 34 wherein the hole transmitting material is selected from the group consisting of aromatic amine complexes and conjugated polymers.

36. (New) An electroluminescent device according to claim 34 wherein the hole transmitting material is a film of a polymer selected from the group consisting of poly(vinylcarbazole); N,N'-diphenyl-N,N'-bis (3-methylphenyl)-1,1'-biphenyl-4,4'-diamine (TPD); polyaniline; substituted polyanilines; polythiophenes; substituted polythiophenes; polysilanes and substituted polysilanes; polymers of cyclic aromatic compounds; poly (p-phenylenevinylene)-PPV and copolymers; PPV; poly(2,5 dialkoxyphenylene vinylene); poly (2-methoxy-5-(2-methoxypentyloxy-1,4-phenylene vinylene); poly(2-methoxypentyloxy)-1,4 phenylenevinylene); poly(2-methoxy-5-(2-dodecyloxy-1,4-phenylenevinylene); other poly(2,5 dialkoxyphenylenevinylenes) with at least one of the alkoxy groups being a long chain solubilising alkoxy group; poly fluorenes; oligofluorenes; polyphenylenes; oligophenylenes; polyanthracenes and oligo anthracenes; and polythiophenes and oligothiophenes.

37. (New) An electroluminescent device according to claim 31 wherein there is a layer of a hole transmitting material between the first electrode and the layer of electroluminescent compound, and further wherein the hole transmitting material is selected from the group consisting of aromatic amine complexes and conjugated polymers.

38. (New) An electroluminescent device according to claim 37 wherein the hole transmitting material is a film of a polymer selected from the group consisting of poly(vinylcarbazole); N,N'-diphenyl-N,N'-bis (3-methylphenyl) -1,1' -biphenyl -4,4'-diamine (TPD); polyaniline; substituted polyanilines; polythiophenes; substituted polythiophenes; polysilanes and substituted polysilanes; polymers of cyclic aromatic compounds, poly (p-phenylenevinylene)-PPV and copolymers; PPV; poly(2,5 dialkoxyphenylene vinylene); poly (2-methoxy-5-(2-methoxypentyloxy-1,4-phenylene vinylene); poly(2-methoxypentyloxy)-1,4-phenylenevinylene); poly(2-methoxy-5-(2-dodecyloxy-1,4-phenylenevinylene); other poly(2,5 dialkoxyphenylenevinylenes) with at least one of the alkoxy groups being a long chain solubilising alkoxy group; poly fluorenes; oligofluorenes; polyphenylenes; oligophenylenes; polyanthracenes and oligo anthracenes; polythiophenes and oligothiophenes.

39. (New) An electroluminescent device according to claim 29 wherein there is a layer of an electron transmitting material between the electroluminescent compound layer and the second electrode.

40. (New) An electroluminescent device according to claim 39 wherein the electron transmitting material is selected from the group consisting of metal quinolates and cyano anthracenes.

41. (New) An electroluminescent device according to claim 39 wherein the electron transmitting material is an aluminum quinolate or lithium quinolate.

42. (New) An electroluminescent device according to claim 31 wherein there is a layer of an electron transmitting material between the electroluminescent compound layer and the second electrode.

43. (New) An electroluminescent device according to claim 42 wherein the electron transmitting material is selected from the group consisting of metal quinolates and cyano anthracenes.

44. (New) An electroluminescent device according to claim 42 wherein the electron transmitting material is an aluminum quinolate or lithium quinolate.

45. (New) An electroluminescent device according to claim 29 wherein the second electrode is a material selected from the group consisting of aluminum, calcium, lithium, and silver/magnesium alloys.

46. (New) An electroluminescent device according to claim 31 wherein the second electrode is a material selected from the group consisting of aluminum, calcium, lithium, and silver/magnesium alloys.

47. (New) An electroluminescent device according to claim 34 wherein the hole transmitting material and the electroluminescent compound are mixed to form one layer in a proportion ranging from about 5% of the electroluminescent compound and 95% of the hole

transmitting material to about 95% of the electroluminescent compound and 5% of the hole transmitting material.

48. (New) An electroluminescent device according to claim 39 wherein the electron transmitting material and the light emitting metal compound are mixed to form one layer in a proportion ranging from about 5% of the light emitting metal compound and 95% of the electron transmitting material to about 95% of the light emitting metal compound and 5% of the electroluminescent compound.

49. (New) An electroluminescent device according to claim 48 wherein there is a copper phthalocyanine layer on the first electrode and a lithium fluoride layer on the second electrode.